CLAIMS:

1. A process for manufacturing a polyurethane including the steps of:
   a) mixing a difunctional alcohol with a difunctional isocyanate to form a first mixture;
   b) heating the first mixture;
   c) adding a chain extender to the heated first mixture to form a second mixture, said chain extender containing reactive hydrogen groups; and
   d) neutralizing the second mixture by a neutralizer to form the polyurethane.

2. The process of claim 1, wherein the first mixture is heated at a temperature of about 80 degree Celsius to about 100 degree Celsius in step b).

3. The process of Claim 2, wherein the first mixture is heated is heated for about two to about five hours.

4. The process of Claim 1, wherein the difunctional isocyanate is selected from the group consisting of aliphatic diisocyanates, aromatic diisocyanates, alicyclic diisocyanates, and their mixture thereof.

5. The process of Claim 4, wherein said aliphatic diisocyanates is selected form the group consisting of isophorone diisocyanate, 4,4-dicyclohexylmethane diisocyanate, 1,6-hexamethylene diisocyanate and tetramethylxylylene diisocyanate.

6. The process of Claim 4, wherein said aromatic diisocyanates is selected form the group consisting of diphenylemethane-4,4-diisocyanate, tolulene diisocyanate and 1,6-hexamethylene diisocyanate.

7. The process of Claim 1, wherein the difunctional alcohol is selected from the group consisting of polyether diol, polyester diol, polycarbonate, polycaprolactone, and their mixture thereof.

8. The process of Claim 7, wherein the difunctional alcohol is selected from the group consisting of polypropylene glycol, 1,4-butane glycol adipate, polytetramethylene glycol, polyethylene glycol, bisphenol-A+propylene oxide, and their mixture thereof.

9. The process of Claim 1, wherein said chain extender is selected from 1,4-butanediol, 1,3-propanediol, 1,2-ethanediol, 4,4'-dihydroxy biphenyl, 2,2-dimethylolpropanic acid, and their mixture thereof.

10. The process of Claim 1, wherein the molar ratio between the difunctional isocyanate and the difunctional alcohol is from about 1:1.5 to about 1:5.0.

11. The process of Claim 1, wherein the neutralizer is selected from the group consisting of water-soluble tertiary amines, alkali metal hydrides, and their mixtures thereof.

12. The process of Claim 12, wherein and the molar ratio of the reactive hydrogen groups to the neutralizer is from about 1:0.5 to about 1:1.2

13. The process of Claim 1 being performed without using a solvent.

14. The process of Claim 1 being performed in the presence of not more than 30 weight percent of a water-miscible solvent having no reactive hydrogen.

15. The process of Claim 14 further including the steps of:

e) dispersing the polyurethane in water;

f) removing the water-miscible solvent.

16. The process as claimed in claim 15, wherein the amount of water is about 5% to about 50 weight percent with respect to the overall solid content.

17. The process as claimed in claim 15, wherein the temperature of the water is about 5 degree Celsius to about 80 degree Celsius.

18. Polyurethane manufactured by the process of any one of Claims 1 to 17.

19. Polyurethane of Claim 18 having a tensile modulus varying with temperature, and a glass transition or melting temperature, wherein the ratio of the tensile modulus at temperatures 10°C higher than the glass transition or melting temperature, to the

tensile modulus at temperatures 10°C lower than the glass transition or melting temperature, is about 50 to 400.

20 Polyurethane of Claim 19, wherein the glass transition or melting temperature is in the range of about –30°C to about 80°C.

21. Polyurethane having a tensile modulus varying with temperature, and a glass transition or melting temperature, wherein the ratio of the tensile modulus at temperatures 10°C higher than the glass transition or melting temperature, to the tensile modulus at temperatures 10°C lower than the glass transition or melting temperature, is about 50 to 400.

22 Polyurethane of Claim 21, wherein the glass transition or melting temperature is in the range of about –30°C to about 80°C.